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## Leak Detecting Instruments

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## Applications for Leak Detecting Instruments

Test Instruments / Leak Detectors		PHOENIX L300i	PHOENIX L300i DRY	PHOENIX L300i MODUL (oil-free)	PHOENIX L300i MODUL (oil sealed)	PHOENIX L500i	PHOENIX L340i	PHOENIX L320i Fab
<b>Applications</b>								
Semiconductor production	■	■	■		■		■	
Vacuum coating	■			■	■			
Research and development	■	■	■	■	■	■	■	
Chemistry/pharmaceutical	■	■	■	■	■	■	■	
Metallurgy/furnaces	■			■	■			
Lamps and tube manufacture	■			■	■	■	■	
Automotive industry	■			■	■	■	■	
Laser engineering	■	■			■			
Particle accelerators		■	■		■		■	
Analytical engineering	■	■	■	■	■	■	■	
Systems with cryopumps	■	■	■	■	■		■	
Cooling and air conditioning		■	■		■		■	
Electrical engineering	■	■	■	■	■		■	
Mechanical engineering	■			■	■		■	
Power plants	■			■	■		■	
Systems engineering	■			■	■		■	
UHV applications	■	■	■	■	■		■	

# Accessories for Leak Detecting Instruments

Test Instruments / Leak Detectors		PHOENIX L300i	PHOENIX L300i DRY	PHOENIX L300 MODUL (oil-free)	PHOENIX L300 MODUL (oil sealed)	PHOENIX L500i	PHOENIX L340i	PHOENIX L320i Fab
<b>Accessories</b>	Page							
Remote control unit RC 310	788	■	■	■	■		■	■
Calibrated leaks	792	■	■	■	■	■	■	■
Screw-in calibrated leaks	794	■	■	■	■	■	■	■
Transportation means	796	■	■	■	■			
Partial flow system	796	■		■	■			
PC software LeakWare	796	■	■	■	■		■	■
Helium sniffers	798	■	■	■	■	■ <sup>1)</sup>	■	■
Exhaust filter sets		standard	standard			standard		
Interfaces		standard	standard	standard	standard	standard	standard	standard
Gas ballast facilities		standard				standard		
Trigger relay boards		standard	standard	standard	standard	standard	standard	standard

<sup>1)</sup> Upon request

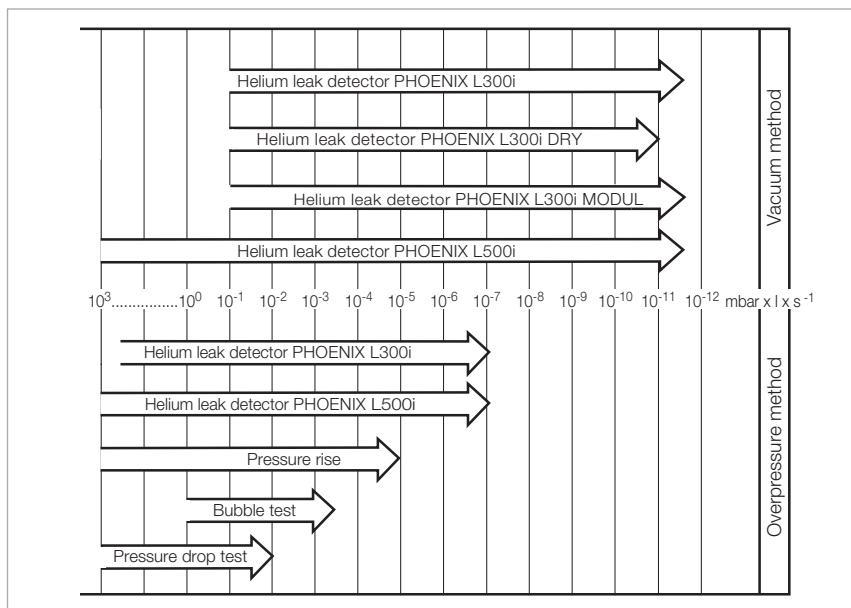
# Leak Detection – Leak Testing

Whether a component or a system is leak-tight depends on the application it is to be used in and the leak rate that is acceptable. Absolutely leak-tight components and systems do not exist. A component is considered technically leak-tight if its leak rate remains below a value defined for this particular component. In order to provide a quantitative measure, the term “leak rate” with the symbol “ $q_L$ ” was introduced. In vacuum technology  $\text{mbar} \times \text{l} \times \text{s}^{-1}$  is used as the unit for leak rates.

A leak rate of  $1 \text{ mbar} \times \text{l} \times \text{s}^{-1}$  exists in a closed vessel having a volume of 1 liter when the pressure increases by 1 mbar within one second, or in case of an overpressure it decreases by 1 mbar within one second.

$$q_L = \frac{V \times \Delta p}{\Delta t} \quad (\text{mbar} \times \text{l} \times \text{s}^{-1})$$

The wide range of leak rates from several  $100 \text{ mbar} \times \text{l} \times \text{s}^{-1}$  to below  $10^{-11} \text{ mbar} \times \text{l} \times \text{s}^{-1}$  as they occur in practice necessitates the use of different



Overview of the leak rate detection ranges

leak detection principles and hence leak detectors (see figure). Besides the determination of the total leak tightness, it is usually important to locate the leak, quickly and precisely, in order to seal it. Instruments for local

leak detection are called leak detectors. The leak detectors presented in this product section can be used for the localization of leaks, and in addition some are suitable for determining the total leak rate of test objects.

## Leak Rate

	$\text{Pa} \times \text{m}^3 \times \text{s}^{-1}$	$\text{atm} \times \text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)}$ $\text{mbar} \times \text{l} \times \text{s}^{-1} \text{ } ^{1)}$	$\text{atm} \times \text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)}$ $\text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)}$
$\text{Pa} \times \text{m}^3 \times \text{s}^{-1}$	1	10	9.87
$1 \text{ mbar} \times \text{l} \times \text{s}^{-1} \text{ (He)}$	0.1	1	0.99
$1 \text{ atm} \times \text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)} = \text{cm}^3 \text{ (STP)} \times \text{s}^{-1}$	0.101	1.01	1
$1 \text{ Torr} \times \text{l} \times \text{s}^{-1} \text{ } ^{1)}$	0.133	1.33	1.33
$1 \text{ kg} \times \text{h}^{-1} \text{ air}$	23.4	234	234
$1 \text{ g/a C}_2\text{H}_2\text{F}_4 \text{ (R 134a)}$	$6.41 \times 10^{-7}$	$7.58 \times 10^{-6}$	$6.3 \times 10^{-6}$

## Leak Rate

	$\text{atm} \times \text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)}$ $\text{Torr} \times \text{l} \times \text{s}^{-1} \text{ } ^{1)}$	$\text{kg} \times \text{h}^{-1}$ <b>Air</b>	$\text{g/a}$ <b><math>\text{C}_2\text{H}_2\text{F}_4 \text{ (R 134a)}</math></b>
$\text{Pa} \times \text{m}^3 \times \text{s}^{-1}$	7.5	$4.28 \times 10^{-2}$	$2.28 \times 10^6$
$1 \text{ mbar} \times \text{l} \times \text{s}^{-1} \text{ (He)}$	0.75	$4.3 \times 10^{-3}$	$2.28 \times 10^5$
$1 \text{ atm} \times \text{cm}^3 \times \text{s}^{-1} \text{ } ^{1)} = \text{cm}^3 \text{ (STP)} \times \text{s}^{-1}$	0.76	$4.3 \times 10^{-3}$	$2.3 \times 10^5$
$1 \text{ Torr} \times \text{l} \times \text{s}^{-1} \text{ } ^{1)}$	1	$5.7 \times 10^{-3}$	$3.0 \times 10^5$
$1 \text{ kg} \times \text{h}^{-1} \text{ air}$	175	1	–
$1 \text{ g/a C}_2\text{H}_2\text{F}_4 \text{ (R 134a)}$	$4.8 \times 10^{-6}$	–	1

<sup>1)</sup> According to international system of units only  $\text{Pa} \times \text{m}^3 \times \text{s}^{-1}$  is permissible

# Leak Detection Methods

There are two main groups of leak detection methods; for both there are special instruments available:

## Vacuum Methods

The equipment to be tested is evacuated. The pressure ratio between inside and outside is 0:1.

### Overpressure Methods

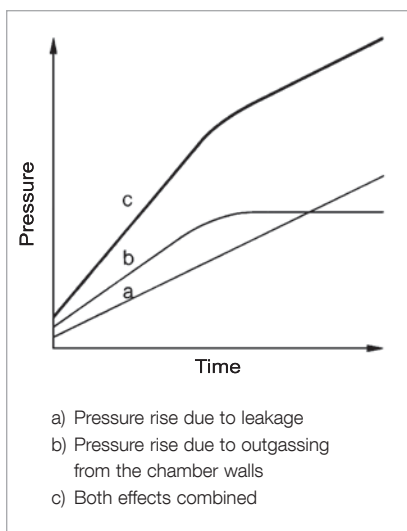
The equipment to be tested is pressurized with a search gas or a search gas mixture.

The pressure ratio between inside and outside is over 1:1.

Between the two methods there exist many variations depending on the particular application.

## General Notes

1. The lowest leak rates can only be measured by employing the vacuum method, whereby the following applies: The lower the leak rate, the higher the requirements are concerning cleanliness and ultimate vacuum.
2. If possible the test objects should be tested under the same conditions that will be used in their final application, i.e. parts for vacuum operation should be tested according to the vacuum method and parts for overpressure operation should be tested using the overpressure method.



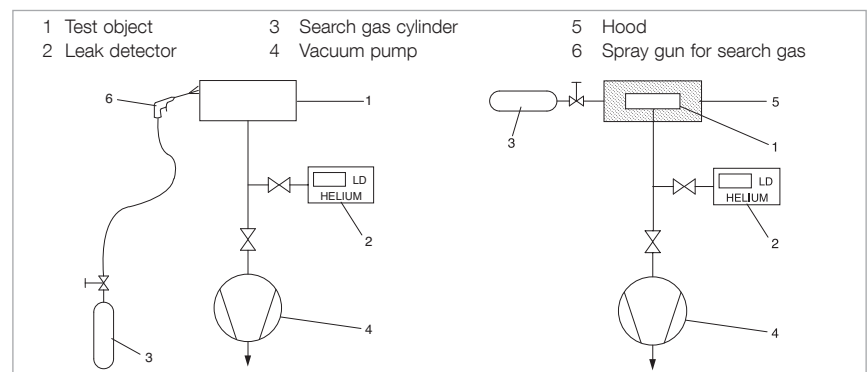
Pressure rise in a vacuum chamber after switching off the pump; double log. plot

## Leak Testing Based on Vacuum Methods

(Vacuum inside the test object.)

### Pressure Rise Method

With this method it is only possible to determine the total leak rate. The test object is evacuated with a vacuum pump or a vacuum pump system. A valve is used to isolate the test object from the vacuum pump. The pressure will then rise as a function of time. Curve (a) shows the theoretical pressure rise if there is only a leak. Curve (b) shows the pressure rise due to outgassing from the surfaces of the test object. This pressure rise tends to tail off in the direction of a saturation level. If in such a case the time allowed for monitoring the pressure rise is too short, a leak will be indicated which in reality does not exist. If one waits long enough for the pressure to rise, i.e. after the bend of curve (b) the outgassing process can then be disregarded, so that the leak rate can be determined from the known volume of the test object and the measured pressure rise over a fixed rise time (see equation on page before). Curve (c) shows the pressure rise as it occurs in practice, where out-gassing and leak rate add. The detectable leak rate depends on the volume of the test object, the obtained ultimate pressure and the out-gassing from the test object. In connection with very large test objects this method is time consuming if extremely low leak rates are to be determined in the fine and rough vacuum range.



Local leak detection – Evacuated test object (left) and Integral method – Evacuated test object (right)

## Local Leak Detection

The test object is evacuated by a vacuum pump (auxiliary pump) until the pressure is low enough for the leak detector to operate. When using a helium leak detector, its own pump system will take care of further evacuation. Suspicious spots on the test object will then be sprayed with a fine jet of search gas. Search gas entering through leaks into the test object is pumped out by the vacuum pump and it is converted by the leak detector into an electrical signal which is then displayed. This permits rapid detection and determination of the size of even the smallest leaks.

## Integral Method

Determination of the total leak rate of a test object. The testing arrangement is the same as for local leak detection, but in this case the test object is not sprayed with search gas on selected areas, but it is surrounded by a hood or a chamber which is filled with the search gas. Thus the entire outer surface of the test object comes into contact with the search gas. If the search gas enters the test object, the total leak rate is indicated independently of the number of existing leaks. With helium leak detectors it is possible to determine the helium content of the air. This is utilized in the detection of gross leaks.

## Leak Testing Based on Overpressure Methods

(Overpressure within the test object.)

### Pressure Drop Method

The test object is filled with a gas (for example air or nitrogen) until the testing pressure is reached. Precision vacuum gauges are used to detect a possible pressure drop during the testing period. This method is simple to implement, it is suitable for the determination of gross leaks and can be improved upon by using differential pressure gauges. By applying soap solutions or similar, leaks can be located.

### Local Leak Detection with Leak Detectors – Sniffing

The test object is filled with the search gas or the search gas/air mixture to which the leak detector is sensitive. The leak detector is equipped with a sniffer probe, whereby there is a low pressure at the probe tip. If the sniffer tip passes suspicious points on the test object the search gas coming out of the leak is sucked in and transferred to the detection system of the leak detector. After conversion into electrical signals these are displayed optically and acoustically by the leak detector.

### Integral Method – Hood Test

To determine the total leak rate of a test object subjected to a search gas overpressure, the test object is surrounded by a hood of a known volume. The search gas which escapes through the leaks collects in the hood.

After a fixed accumulation period a sniffer probe is used to measure the concentration of the search gas which has collected in the hood.

Before this the leak detector should be calibrated by a reference measurement using a known search gas concentration.

The leak rate can then be determined by the equation for  $q_L$  where  $V$  is the volume of the hood,  $\Delta p$  is the partial pressure difference of the search gas (concentration change) and  $t$  is the accumulation period.

Uncertainties in the determination of the volume, leaks in the hood and a wrong accumulation period make precise leak rate measurements based on this method very questionable.

### Integral Method – Vacuum Hood Test

This test is a variation of the hood test described above, which has considerable advantages. A vacuum chamber which is evacuated by an auxiliary pump and which is connected to a leak detector is used as the hood. The search gas escaping through the leaks is converted by the detection system of the leak detector into electrical signals which are immediately displayed. After calibration of the leak detector with a calibrated leak it is possible to quantitatively determine the total leak rate.

This method permits the detection of very small leaks and is especially suited for automatic industrial leak detection.

## Integral Method – Bombing-Test

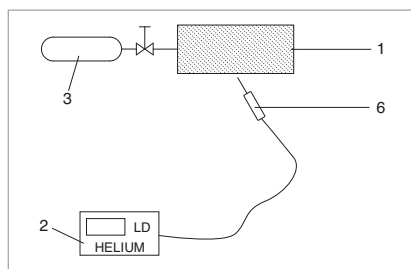
This method is used for testing hermetically sealed components such as transistors, IC-packages or dry reed relays. It is basically a variation of the vacuum hood test. Here the test objects are placed in a vessel which is pressurized with the search gas – preferably helium. At a fairly high search gas pressure and after a period of up to several hours it is tried to enrich the search gas inside leaky test objects. This is the actual so called “bombing” process.

After this, the test objects are transferred to a vacuum chamber and their total leak rate is determined in the same way as in the vacuum hood test. During evacuation of the vacuum chamber down to the required testing pressure, those test objects which have a gross leak already lost their accumulated search gas. These parts are not detected as leaking during the actual leak test. Therefore the test with the vacuum chamber is often preceded by a “bubble test”.

This method permits the detection of the lowest leak rates and is used mainly in automatic industrial leak testing especially when it is not possible to fill the parts with gas in any other way.

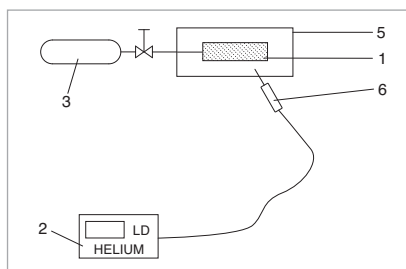
#### Key to the Figures

- |                 |                       |
|-----------------|-----------------------|
| 1 Test object   | 3 Search gas cylinder |
| 2 Leak detector | 4 Vacuum pump         |

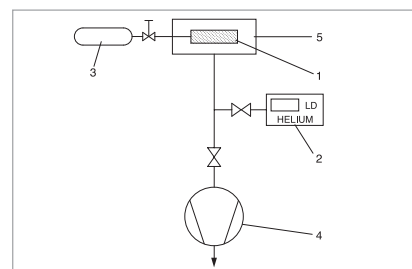


Local leak detection –  
Search gas overpressure in the test object

- |                 |
|-----------------|
| 5 Hood          |
| 6 Sniffer probe |



Integral method (search gas accumulation)  
Search gas overpressure in the test object



Integral method –  
Search gas overpressure in the test object

# Operating Principles of the Helium Leak Detectors

## Operating Principle

A helium leak detector permits the localization of leaks and the quantitative determination of the leak rate, i.e. the gas flow through the leak. Such a leak detector is therefore a helium flow meter.

In practice the leak detector performs this task by firstly evacuating the part which is to be tested, so that gas from the outside may enter through an existing leak due to the pressure difference present. If only helium is brought in front of the leak (for example by using a spray gun) this helium flows through the leak and is pumped out by the leak detector. The helium partial pressure present in the leak detector is measured by a sector mass spectrometer and is displayed as a leak rate. This is usually given in terms of volume flow of the helium (pV-flow).

## Important Specifications

The two most important features of a leak detector are its measurement range (detection limits) and its response time.

The measurement range is limited by the lowest and the highest detectable leak rate. The lowest detectable leak rate is defined by the sum of drift and noise in the most sensitive measurement range. Usually the sum of noise amplitude and zero drift per minute is made to be equivalent to the lowest detectable leak rate. With leak detectors the amount of drift is so low, that the noise amplitude alone determines the detection limit.

The highest detectable leak rate depends strongly on the method employed. Especially the counterflow method and partial flow operation (see description below) permit the measurement of very high leak rates even with a sensitive helium leak detector. In addition the multistage switchable high impedance input amplifiers of the leak detectors also permit the measurement of high leak rates.

In practical applications, especially in the localization of leaks the response time is of great significance. This is the time it takes from spraying the test object with

helium until a measured value is displayed by the leak detector. The response time of the electronic signal conditioning circuitry is an important factor in the overall response time. In the case of leak detectors the response time of the electronic circuitry is well below 1 s.

The volume flow rate for helium at the point of the test object is of decisive significance to leak detection on components which are pumped down solely by the leak detector. This volume flow rate provided by the leak detector takes care of the helium entering through a leak and it ensures quick detection by the leak detector. On the other hand the volume of the test object delays the arrival of the helium signal. The response time can be calculated on the basis of the following simple equation:

$$\text{Response time for helium } t_A = 3 \frac{V}{S_{\text{He}}} \\ (\text{for 95\% of the final value})$$

with  $V$  = Volume of the test object  
 $S_{\text{He}}$  = Volume flow rate for helium at the point of the test object  
(or at the inlet of the leak detector, if it alone pumps down the test object).

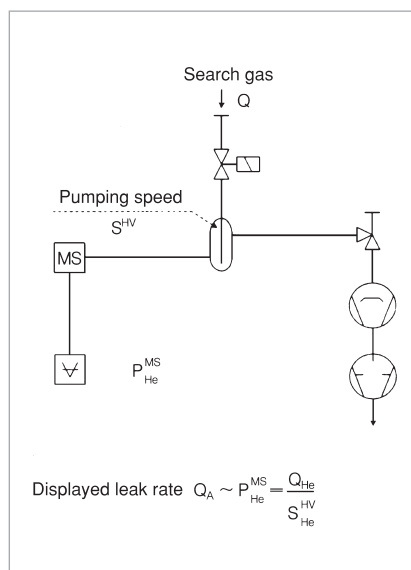
## Main Flow Method

The classic operating principle of helium leak detectors is based on the main flow method. Here the entire helium flow passes through the high vacuum system of the leak detector, where the mass spectrometer measures the partial pressure of the helium. In this, the use of a liquid nitrogen cold trap is essential to remove water vapor or other condensable gases in the vacuum system which impair the operation. Moreover, the use of a cold trap permits the low operating pressures for the mass spectrometer to be reached (below  $10^{-4}$  mbar) despite the directly connected (and possibly contaminated) test object.

The advantages of the main flow method are:

- Highest sensitivity, i.e. low detection limit
- Short response time due to a high volume flow rate at the inlet.

The main flow method is thus especially suitable for stationary leak detection on components. Leak detection on systems having their own pump sets and at higher pressures requires the use of an external throttling valve, i.e. a partial flow with subsequently reduced sensitivity is utilized.



Main flow method

## Counterflow Method

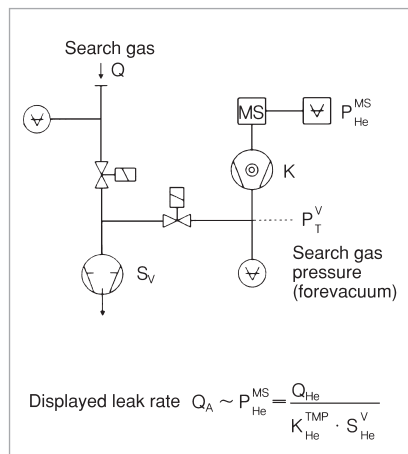
With this method the test object is not connected to the high vacuum. Instead it is connected to the forevacuum (between turbomolecular pump and backing pump), so that the entire gas flow (especially water vapor) does not contribute to the pressure increase in the mass spectrometer. Thus a cold trap is no longer required!

The helium which now enters the forevacuum can still be detected, as it is able to flow against the pumping direction of the turbomolecular pump into the mass spectrometer. This is due to the high particle velocity of the helium. The sensitivity of this counterflow arrangement is equal to that of the main flow principle, provided the right combination of volume flow rate of the backing pump and helium compression of the turbomolecular pump is used.

The advantages of the counterflow method are:

- No liquid nitrogen is required
- High permissible inlet pressures (i.e. pressure within the test object)

This makes the counterflow method especially suitable for mobile leak detection on systems. For leak detection on larger components where a short response time is essential (i.e. high volume flow rate) an additional turbomolecular pump stage is required at the inlet of the leak detector.



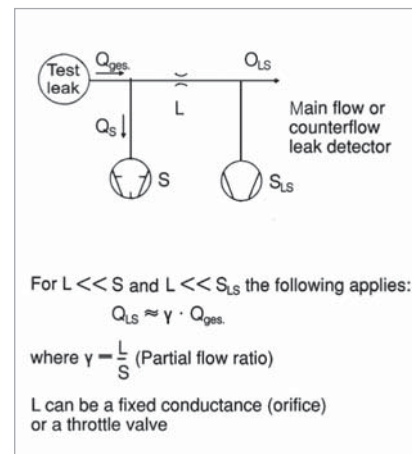
Counterflow method

## Partial Flow Method

In order to expand the measurement range in the direction of higher leak rates and for operation at higher inlet pressures, helium leak detectors incorporate a partial flow or a gross leak system. This consists basically of a throttle and a rotary vane pump. At pressures above the normal inlet pressure (main flow: above  $10^{-2}$  mbar, counterflow: above  $10^{-1}$  mbar) or in the case of high helium leak rates, the inlet valve is closed and the main flow is allowed to enter the partial flow pump, whereas only a small part enters the leak detector via the partial flow throttle. Thus the total pressure and the helium pressure are dropped to values suitable for operation of the leak detector.

To obtain correct leak rate readings in the partial flow mode, the partial flow ratio, i.e. the ratio between the actually measured gas flow and the total gas flow must be known and stable.

In all leak detectors this is achieved by a partial flow throttle made of ruby with a precisely machined hole. This ensures that the quantitatively determined leak rates are always correct without calibration, even for gross leaks.



Partial flow method



### **Calibration of Helium Leak Detectors with Calibrated Leaks**

In the process of leak detection one expects that a test object which does not have a leak produces a zero reading on the leak detector. In this any malfunctions are excluded. Thus calibrated leaks, i.e. artificial leaks which produce a known helium leak rate are essential for reliable results.

To obtain a quantitatively correct leak rate reading the sensitivity of the leak detector must also be adjusted. This requires the use of a calibrated leak.

Oerlikon Leybold Vacuum offers calibrated helium leaks of various designs covering the range between  $10^{-9}$  to  $10^{-4}$  mbar x l x s<sup>-1</sup> as part of the standard range of products. All leak rates are traceable to the standards of the DAkkS Calibration Service controlled

by the PTB (Federal Institution of Physics and Technology). If requested each helium calibrated leak can be supplied with a calibration certificate issued by the DAkkS Calibration Service. The calibration itself is performed by the DAkkS Calibration Service for Vacuum which is run by Oerlikon Leybold Vacuum on behalf of the PTB.

# Products

## Helium Leak Detector PHOENIX L300i



PHOENIX L300i

### Advantages to the User

- Lowest detectable leak rate
- Short He recovering time condition
- Quick startup under 2 minutes
- Extremely fast response time
- Oil-free gas admission system
- One of the smallest helium leak detectors in the world
- High sensitivity
- Fast leak rate readout also at low leak rates
- Service friendly through modular design

### Typical Applications

Leak tests in connection with

- Quality assurance
- Automotive industry
- Analytical instruments
- Systems manufacture
- Power station engineering
- Research and development
- Semiconductor industry
- High vacuum and ultra-high vacuum engineering
- Ideal tool for industrial series production testing – in the cooling and air conditioning industries, for example

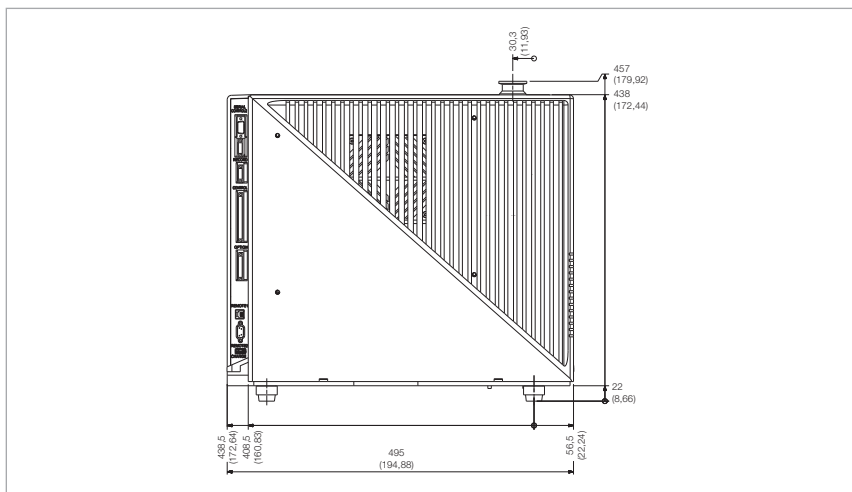
The PHOENIX L300i is a portable multi-purpose helium leak detector and equally well suited to both service and series production testing.

The rugged modular design and its ease of use make the PHOENIX L300i one of the most user-friendly leak detector in its class.

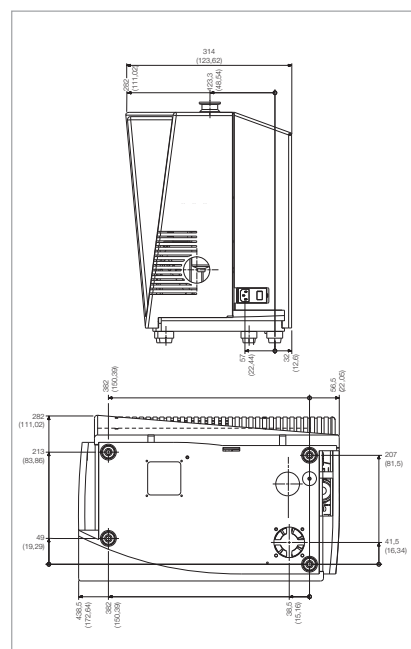
Through the remote controls tablet and RC 310, remote monitoring and control is possible.

In connection with the sniffer lines which are available as accessories the PHOENIX L300i may also be used as a sniffer leak detector.

In connection with a partial flow pump set the PHOENIX L300i may also be used for the detection of leaks on large vessels.



Dimensional drawing for the PHOENIX L300i (rear side)



Dimensional drawing for the PHOENIX L300i (side and upper side)

## Technical Data

## PHOENIX L300i

Minimum detectable helium leak rate		
Vacuum mode	mbar x l x s <sup>-1</sup>	≤ 5 x 10 <sup>-12</sup>
Sniffer mode	mbar x l x s <sup>-1</sup>	< 1 x 10 <sup>-7</sup>
Minimum detectable hydrogen leak rate		
Vacuum mode	mbar x l x s <sup>-1</sup>	≤ 1 x 10 <sup>-8</sup>
Sniffer mode	mbar x l x s <sup>-1</sup>	< 1 x 10 <sup>-7</sup>
Units of measurement (selectable)		
Pressure		mbar, Pa, atm, Torr
Leak rate		mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr
Sniffer mode		ppm, g/a eq, oz/yr eq
Leak rate measurement range	mbar x l x s <sup>-1</sup>	1 x 10 <sup>-12</sup> to 1 x 10 <sup>-1</sup>
Measurement ranges		12 decades
Max. inlet pressure	mbar (Torr)	15 (11.25)
Pumping speed during the evacuation process		
50 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	2.5 (1.5)
60 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	3.0 (1.8)
Pumping speed (helium) at the inlet		
GROSS mode	l/s	0.4
FINE mode	l/s	> 2,5
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 1
Run-up time (after starting)	min	≤ 2
Mass spectrometer		180° magnetic sector field
Ion source		2 filaments; iridium/yttria-oxide
Detectable masses	amu	2, 3 and 4
Inlet port	DN	25 ISO-KF
Dimensions (W x H x D)		495 x 457 x 314
Weight	kg (lbs)	40.0 (88.2)
Available languages		English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish and Korean

## Ordering Information

## PHOENIX L300i

	Part No.
PHOENIX L300i	
EURO version	
230 V, 50/60 Hz, mbar readout, with integrated calibrated leak TL 7	<b>250000V01</b>
US version	
115 V, 60 Hz, mbar readout, with integrated calibrated leak TL 7	<b>251000V01</b>
Japan version	
100 V, 50/60 Hz, mbar readout, with integrated calibrated leak TL 7	<b>251100V01</b>
Tablet incl. software (APP), WiFi module, protection case (IP 67) PHOENIX L300i	<b>252005V01</b>
Tablet incl. software (APP), communication cable and E-chip, protection case (IP 67) PHOENIX L300i	<b>252005V02</b>
Tablet holder PHOENIX L300i	<b>252007V01</b>
BARCODE scanner tablet PHOENIX L300i	<b>252008V01</b>
Tablet table stand	<b>252009V01</b>
Tablet lock	<b>252010V01</b>
Partial flow system (115-230 V)	<b>140 20</b>
PC software LeakWare	<b>140 90</b>
For further accessories see para. "Accessories for PHOENIX L300i, PHOENIX L300i DRY and PHOENIX L300i MODUL"	

# Portable and Dry Helium Leak Detector PHOENIX L300i DRY



PHOENIX L300i DRY

The PHOENIX L300i DRY is a compact portable helium leak detector capable of meeting the highest cleanliness requirements.

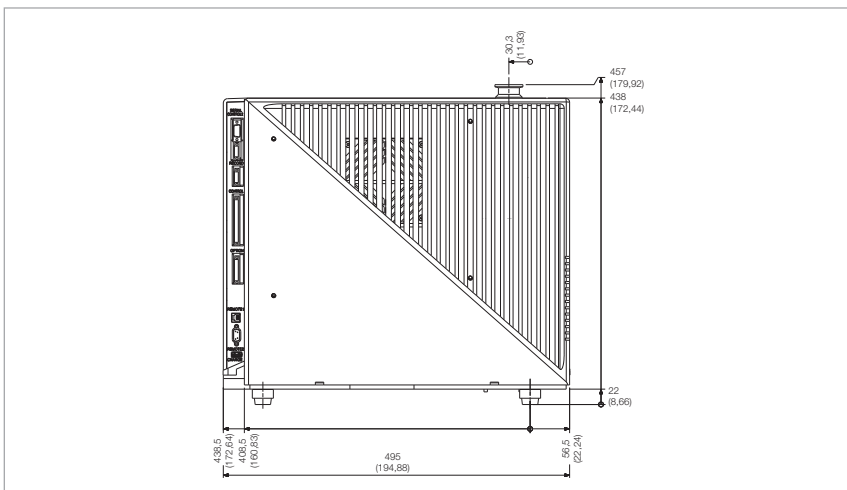
Based on the well-proven technology of the PHOENIX L300i, equipped with an oil-free pump system, the PHOENIX L300i DRY meets the highest requirements concerning cleanliness while at the same time being small in size.

## Advantages to the User

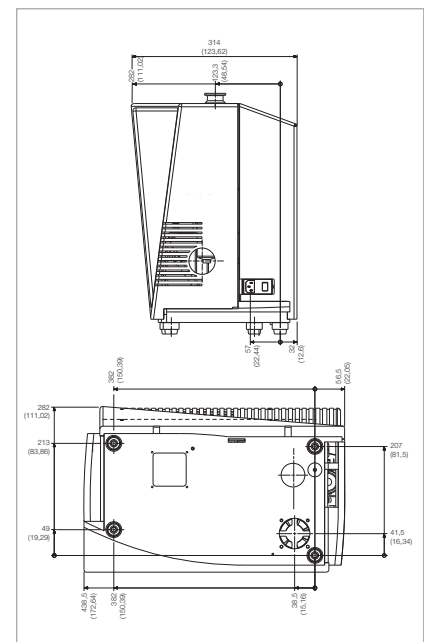
- Oil-free "dry" pump system
- Small footprint
- Quick start-up
- Extremely fast response
- Service friendly through modular design
- Integrated helium contamination protection

## Typical Applications

- Leak tests with stringent requirements concerning cleanliness, for example
- Semiconductor industry
  - after repairs or maintenance work
  - Production of semiconductor components
  - Pharmaceutical/medicine
  - Laser



Dimensional drawing for the PHOENIX L300i DRY (rear side)



Dimensional drawing for the PHOENIX L300i DRY (side and upper side)

## Technical Data

## PHOENIX L300i DRY

Minimum detectable helium leak rate		
Vacuum mode	mbar x l x s <sup>-1</sup>	≤ 3 x 10 <sup>-11</sup>
Sniffer mode	mbar x l x s <sup>-1</sup>	< 1 x 10 <sup>-7</sup>
Minimum detectable hydrogen leak rate		
Vacuum mode	mbar x l x s <sup>-1</sup>	≤ 1 x 10 <sup>-8</sup>
Sniffer mode	mbar x l x s <sup>-1</sup>	< 1 x 10 <sup>-7</sup>
Units of measurement (selectable)		
Pressure		mbar, Pa, atm, Torr
Leak rate		mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr
Sniffer mode		ppm, g/a eq, oz/yr eq
Leak rate measurement range	mbar x l x s <sup>-1</sup>	1 x 10 <sup>-11</sup> to 1 x 10 <sup>-1</sup>
Measurement ranges		11 decades
Max. inlet pressure	mbar (Torr)	15 (11.25)
Pumping speed during the evacuation process		
50 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	1.6 (0.94)
60 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	1.8 (1.06)
Pumping speed (helium) at the inlet		
GROSS mode	l/s	0.02
PRECISION mode	l/s	0.4
FINE mode	l/s	> 2,5
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 1
Run-up time (after starting)	min	≤ 2
Mass spectrometer		180° magnetic sector field
Ion source		2 filaments; iridium/yttria-oxide
Detectable masses	amu	2, 3 and 4
Inlet port	DN	25 ISO-KF
Dimensions (W x H x D)		495 x 457 x 314
Weight	kg (lbs)	35.5 (78.4)
Available languages		English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish and Korean

## Ordering Information

## PHOENIX L300i DRY

	Part No.
PHOENIX L300i DRY	
EURO version	
230 V, 50 Hz, mbar readout, with integrated calibrated leak TL 7	<b>250001V01</b>
US version	
115 V, 60 Hz, mbar readout, with integrated calibrated leak TL 7	<b>251001V01</b>
Japan version	
100 V, 50/60 Hz, mbar readout, with integrated calibrated leak TL 7	<b>251101V01</b>
Tablet incl. software (APP), WiFi module, protection case (IP 67) PHOENIX L300i	<b>252005V01</b>
Tablet incl. software (APP), communication cable and E-chip, protection case (IP 67) PHOENIX L300i	<b>252005V02</b>
Tablet holder PHOENIX L300i	<b>252007V01</b>
BARCODE scanner tablet PHOENIX L300i	<b>252008V01</b>
Tablet table stand	<b>252009V01</b>
Tablet lock	<b>252010V01</b>
Partial flow system (115-230 V)	<b>140 20</b>
PC software LeakWare	<b>140 90</b>
For further accessories see para. "Accessories for PHOENIX L300i, PHOENIX L300i DRY and PHOENIX L300i MODUL"	

# Mobile and Flexible Helium Leak Detector

## PHOENIX L300i MODUL



PHOENIX L300i MODUL

The PHOENIX L300i MODUL combines the excellent characteristics of the PHOENIX L300i with those of the pump system which has been added to the basic leak detector module.

This results in two basic groups:

- Dry, mobile leak detectors with selectable pumping speed
- Oil sealed, mobile leak detectors offering a high pumping speed at an optimum price-to-performance ratio.

### **PHOENIX L300i MODUL with Oil Sealed Backing Pump**

This combination represents a powerful leak detector, the pumping speed of which is adapted to the particular application in each case.

#### **Advantages to the User**

- Cost-effective leak detector
- Pumping speed optimized for the particular application
- Fast response
- Quick recovery
- High sensitivity
- Fast leak rate readout also at low leak rates

#### **Typical Applications**

All applications involving short cycles and/or larger volumes and which require a mobile system, for example:

- Automotive industry
- Cooling and air conditioning
- Manufacturers of furnaces/machines/systems
- Packaging

The PHOENIX L300i MODUL represents the basic unit of an entire family of leak detectors. It is based on the PHOENIX L300i, but it does not include an integrated backing pump. The customer has to select and add an external backing pump depending on the special application. For example when large vacuum chambers have to be evacuated or higher leak testing cycles are required.

### **PHOENIX L300i MODUL with Dry Compressing Scroll Pump**

This combination represents a dry high-performance leak detector.

#### **Advantages to the User**

- Very high pumping speed which is also acceptable for testing semiconductor production chambers without having to use their own pump systems
- Fast response
- Quick recovery (after helium contamination)
- Absolutely dry
- High sensitivity

#### **Typical Applications**

All applications which demand a clean process, for example:

- Semiconductor industry (chip manufacturers)
- Semiconductor industry (tool manufacturers and subcontractors)
- High purity gas industry
- Research and development
- UHV applications

## Technical Data

## PHOENIX L300i MODUL

		with 1-stage Rotary Vane Pump	with 2-stage Rotary Vane Pump	with Scroll Pump
Minimum detectable helium leak rate				
Vacuum mode	mbar x l x s <sup>-1</sup>	$\leq 5 \times 10^{-11}$	$\leq 5 \times 10^{-12}$	$\leq 8 \times 10^{-12} \text{ } ^1) / \leq 5 \times 10^{-11} \text{ } ^2)$
Sniffer mode	mbar x l x s <sup>-1</sup>	$< 1 \times 10^{-7}$	$< 1 \times 10^{-7}$	$< 1 \times 10^{-7}$
Minimum detectable hydrogen leak rate				
Vacuum mode	mbar x l x s <sup>-1</sup>	$\leq 1 \times 10^{-8}$	$\leq 1 \times 10^{-8}$	$\leq 1 \times 10^{-8}$
Sniffer mode	mbar x l x s <sup>-1</sup>	$< 1 \times 10^{-7}$	$< 1 \times 10^{-7}$	$< 1 \times 10^{-7}$
Max. permissible inlet pressure		15	15	15
with partial flow system		1000	1000	1000
Pumping speed during the evacuation process with the pump (50 Hz)				
SOGEVAC SV 16 BI	m <sup>3</sup> x h <sup>-1</sup> (cfm)	16	–	–
SOGEVAC SV 28 BI	m <sup>3</sup> x h <sup>-1</sup> (cfm)	25	–	–
SOGEVAC SV 40 BI	m <sup>3</sup> x h <sup>-1</sup> (cfm)	40	–	–
TRIVAC D 16 B	m <sup>3</sup> x h <sup>-1</sup> (cfm)	–	16	–
TRIVAC D 25 B	m <sup>3</sup> x h <sup>-1</sup> (cfm)	–	26	–
SCROLLVAC SC 15 D	m <sup>3</sup> x h <sup>-1</sup> (cfm)	–	–	13
SCROLLVAC SC 30 DL	m <sup>3</sup> x h <sup>-1</sup> (cfm)	–	–	26
Pumping speed for helium at the inlet flange				
	l/s	> 2,5	> 2,5	> 2,5
Time constant of the leak signal (blanked off, 63% of final value)				
	s	< 1	< 1	< 1
Leak rate measurement range				
	mbar x l x s <sup>-1</sup>	$1 \times 10^{-12}$ to $1 \cdot 10^{-1}$	$1 \times 10^{-12}$ to $1 \cdot 10^{-1}$	$1 \times 10^{-12}$ to $1 \cdot 10^{-1}$
Units of measurement (selectable)				
Pressure		mbar, Pa, atm, Torr	mbar, Pa, atm, Torr	mbar, Pa, atm, Torr
Leak rate		mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr	mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr	mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr
Sniffer mode		ppm, g/a eq, oz/yr eq	ppm, g/a eq, oz/yr eq	ppm, g/a eq, oz/yr eq
Time until ready for operation				
	min	$\leq 2$	$\leq 2$	$\leq 2$
Mass spectrometer		180° magnetic sector field	180° magnetic sector field	180° magnetic sector field
Ion source		2 yttrium/iridium long-life cathodes	2 yttrium/iridium long-life cathodes	2 yttrium/iridium long-life cathodes
Detectable masses				
	amu	2, 3 and 4	2, 3 and 4	2, 3 and 4
Test port		1 x DN 25 ISO-KF	1 x DN 25 ISO-KF	1 x DN 25 ISO-KF
Dimensions (W x H x D)				
	mm	495 x 456 x 314	495 x 456 x 314	495 x 456 x 314
Weight (without pump)				
	kg (lbs)	30	30	30
Available languages		English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish, Korean	English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish, Korean	English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish, Korean

<sup>1)</sup> With SCROLLVAC SC 30 DL

<sup>2)</sup> With SCROLLVAC SC 15 D

The following Part Numbers contain only the individual components needed for assembly by the customer.

## Ordering Information

## PHOENIX L300i MODUL

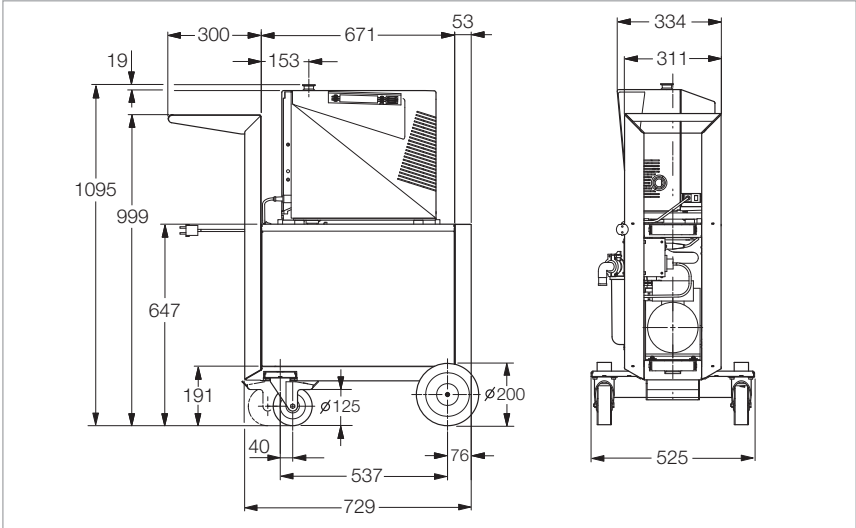
	Part No.	Part No.
PHOENIX L300i MODUL without backing pump 115 - 230 V / 50/60 Hz	<b>250002V01</b>	<b>250002V01</b>
<b>Accessories</b>		
Recommended backing pumps	<b>Euro version</b>	<b>US version</b>
	<b>230 V, 50 Hz</b>	<b>115 V, 60 Hz</b>
SOGEVAC SV 16 BI	<b>960 286</b>	<b>upon request</b>
SOGEVAC SV 28 BI	<b>960 277</b>	<b>upon request</b>
SOGEVAC SV 40 BI	<b>upon request</b>	<b>upon request</b>
TRIVAC D 16 B	<b>113 25</b>	<b>upon request</b>
TRIVAC D 25 B	<b>113 35</b>	<b>upon request</b>
SCROLLVAC SC 15 D	<b>133 001</b>	<b>133 101</b>
SCROLLVAC SC 30 DL	<b>133 050</b>	<b>133 051</b>
For further accessories see para. "Accessories for PHOENIX L300i, PHOENIX L300i DRY and PHOENIX L300i MODUL"		



# CART 300 for PHOENIX L300i



CART 300 (with PHOENIX L300i)



Dimensional drawing for CART 300  
(here as an example with leak detector and scroll pump SCROLLVAC SC 30 DL)

## Technical Data

## CART 300

Dimensions (W x H x D)	mm	525 x 1095 x 1024
Weight without leak detector and pump, approx. kg (lbs) (here as an example with leak detector and scroll pump SCROLLVAC SC 30 DL)		50.0 (110.38)

## Ordering Information

## CART 300

	Euro version	US version
	Part No.	Part No.
CART 300		
without E-Box	252 005	252 005
with E-Box 230 V, EURO version	252 006	-

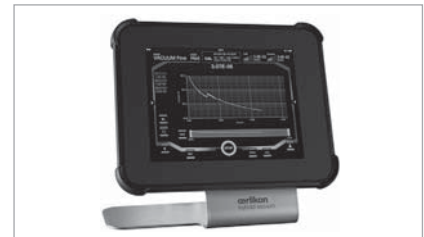
# Helium Leak Detector

## PHOENIX L500i



PHOENIX L500i

The PHOENIX L500i Helium leak detector opens up new dimensions of productivity and reliability for your applications. This is your solution, pioneered with an intelligent tablet control. The smartest and unparalleled user experience in leak detection.



PHOENIX L500i tablet control

### Advantages to the User

- High reliable leak detection
- Fast and reproducible test results
- Improved system design for a high degree of productivity and uptime
- Approved for serial testing
- Rapid evacuation, low contamination degree
- Compact and mobile unit, ergonomic working position
- Simple and comfortable operation
- Sleep mode/wake-up function provides system ready at shift start
- All connections on the backside, easy access to all facilities
- 3 years warranty on the long-life cathodes in the ion sources

### Typical Applications

Quality control of components and subassemblies from industries like

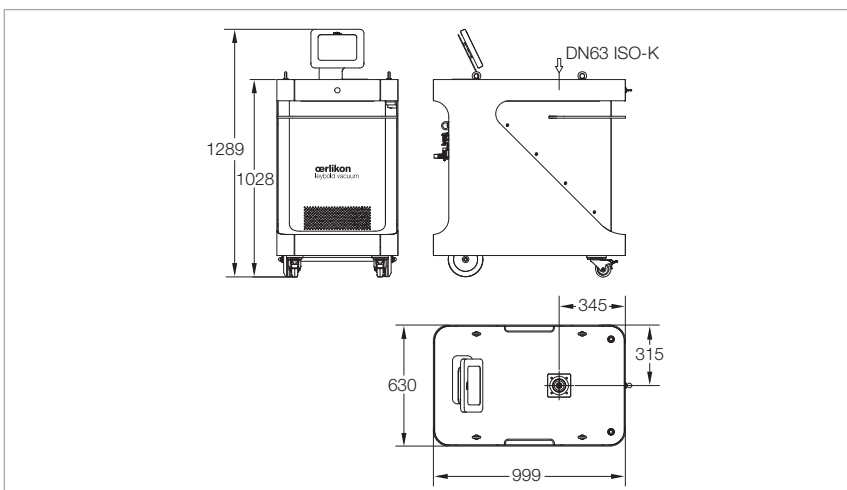
- Electrical engineering (feedthroughs, vacuum sensors, lamps, transformers)
- Automotive (fuel systems, gears)
- Refrigeration and air conditioning
- Packaging (medical, pharmaceutical and food products, barrels)
- Research (fusion facilities, space simulators, particle accelerators)

### Smart Monitoring and Control

- Wireless operation via tablet using WiFi (included within the standard delivery) within a distance of up to 50 m
- Unique ergonomic tablet retainer (included within the standard delivery)
- Easy set-up and intuitive touch-screen operation
- Selectable operation mode for maximized flexibility
- Data logger and readout

### High Speed leak detection

- Response time < 1 s
- Helium pumping speed at the inlet up to 50 l/s
- Extremely short Helium recovery time
- Efficient standby mode and wake-up function saving time and energy
- Reliable and reproducible test results



Dimensional drawing for the PHOENIX L500i

## Technical Data

## PHOENIX L500i

Smallest detectable He leak rate (per AVS 2.1 and EN 1518)	mbar x l x s <sup>-1</sup>	< 5 x 10 <sup>-12</sup>
Max. permissible inlet pressure		
Qualitative measurement	mbar (Torr)	1000 (750)
Quantitative measurement	mbar (Torr)	100 (75)
Detectable masses	amu	2, 3 and 4
Run-up time (until ready of operation)	min	< 3
Inlet flange	DN	63 ISO-K
Max. He pumping speed at the inlet	l/s	50
Response time	s	< 1
Supply voltages 3 phases/N/PE, 50/60 Hz	V	200/208/380/400/460
Weight	kg (lbs)	385 (849)
Dimensions (L x W x H)	mm	999 x 630 x 1028
Tablet ingress protection category with charging cable	IP	65
with cover on the charging connection	IP	67
Available languages		English, German
Units of measurement (selectable)		
Pressure		mbar, Pa, atm, Torr
Leak rate		mbar x l x s <sup>-1</sup> , Pa x m <sup>3</sup> x s <sup>-1</sup> , Torr x l x s <sup>-1</sup> , atm x cc x sec <sup>-1</sup> , sft <sup>3</sup> /yr
Sniffer mode		ppm, g/a eq, oz/yr eq
Leak rate measurement range	mbar x l x s <sup>-1</sup>	5 x 10 <sup>-12</sup> to 1000
Pumping speed during the evacuation process		
50 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	65 (40.0)
60 Hz	m <sup>3</sup> x h <sup>-1</sup> (cfm)	78 (45.9)
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 0.2
Mass spectrometer		180° magnetic sector field
Ion source		2 filaments; iridium/yttria-oxide

## Ordering Information

## PHOENIX L500i

	Part No.
Helium leak detector PHOENIX L500i	
Rotary vane vacuum pump filled with	
Mineral oil LVO 100	<b>503504V901</b>
PFPE oil LVO 400	<b>503504V902</b>
Calibrated leak	
TL 9	<b>144 08</b>
TL 8	<b>165 57</b>
TL 6	<b>155 66</b>
TL 4	<b>155 65</b>
TL 4-6	<b>155 80</b>
Reducer DN 63 ISO-K / DN 40 ISO-KF	<b>887 40</b>
Search gas spray gun for Helium (including 5 m long hose)	<b>165 55</b>
Antistatic worktop	optional

# PHOENIX L340i

## Mobile Helium Leak Detector as Seated Workplace



PHOENIX L340i

The PHOENIX L340i is a mobile leak testing station. It was developed preferably for testing of small series production parts in the vacuum or the sniffer mode. Based on its small footprint and being equipped with 4 wheels it will fit through any standard doorway.

The integrated standard components comprise PHOENIX L300i MODUL with two-stage, oil sealed rotary vane vacuum pump TRIVAC D 25 B as well as a power supply and controller unit.

The PHOENIX L340i is operated through the PHOENIX L300i operator panel, which for this purpose has been integrated in the front panel of the unit. Operation and technical parameters of the PHOENIX L340i can be directly derived from the PHOENIX L300i. Optionally, the PHOENIX L340i may be equipped with an exhaust filter AF16-25 for the TRIVAC, with a dry compressing backing pump SCROLLVAC SC 30 DL or also with a remote control.

### Advantages to the User

- Mobile, convenient seated workplace
- Simple to operate, identical with the PHOENIX L300i
- Compact size, since only standard components like the PHOENIX L300i MODUL or TRIVAC D 25 B have been integrated
- High detection sensitivity for helium, thus very small leaks can be detected
- Rapid entry in to the ready mode
- High pumping speed due to separate backing pump

### Typical Applications

- Quality assurance on
- one off and small series production products
  - equipment for research and development

### Technical Data

### PHOENIX L340i

Lowest detectable helium leak rate (vacuum operation)	mbar x l x s <sup>-1</sup>	$\leq 5 \times 10^{-12}$
Maximum detectable helium leak rate (vacuum operation)	mbar x l x s <sup>-1</sup>	> 0.1
Connecting flange for units under test	DN	40 ISO-KF
Pumping speed during the evacuation process		
with TRIVAC D 25 B	m <sup>3</sup> x h <sup>-1</sup>	approx. 25
with SCROLLVAC SC 30 DL (60 Hz)	m <sup>3</sup> x h <sup>-1</sup>	approx. 25
Pumping speed for helium at the inlet flange	l/s	> 2.5
Time constant of the leak rate signal (blanked off, 63% of the final value)	s	< 1
Time until entering the ready mode	min	< 2
Dimensions (W x H x D)	mm	780 x 1000 x 1000
Height of the bench top	mm	750
Available languages		English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish and Korean

### Ordering Information

### PHOENIX L340i

	Part No.
PHOENIX L340i	upon request
Custom PHOENIX L340i	upon request

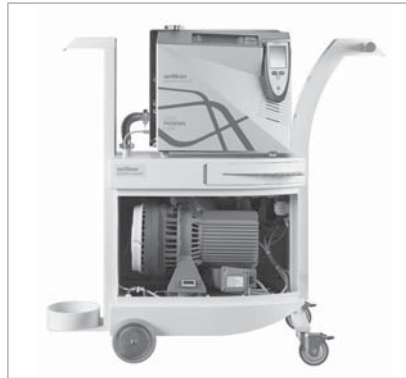
# PHOENIX L320i Fab

## Mobile Helium Leak Detector

### for Increased Cleanness Requirements



PHOENIX L320i Fab



PHOENIX L320i Fab,  
with side cover removed

#### Advantages to the User

- Pleasantly designed mobile leak detector
- Compact dimensions
- High pumping speed due to separate backing pump
- Low particle emissions due to encapsulated backing pump
- Rapid entry in to the ready mode
- High detection sensitivity for helium, thus very small leaks can be detected

- Exclusively standard components have been integrated: convenient access, simple maintenance

#### Typical Applications

Quality assurance on the following:

- Equipment operated in areas with increased cleanness requirements
- Equipment for research and development
- One off products

The PHOENIX L320i Fab is a mobile helium leak detector, chiefly designed to be operated in rooms subject to increased cleanness requirements.

A PHOENIXL 300 Modul serves as the helium leak detection unit, the backing pump is a dry compressing SCROLLVAC SC 30 DL.

Both principal components of the PHOENIX L320i Fab have been accommodated in a visually pleasing and space saving chassis. In order to significantly suppress the emission of particles, the backing pump has been fitted within an encapsulated housing and is supplied with fresh air from the bottom (fan). The side panels of this housing can be easily removed.

The PHOENIX L320i Fab is equipped with useful accessories like gas cylinder holder, hooks for the sniffer hoses and mains cord as well as a separate switch for the backing pump.

#### Technical Data

#### PHOENIX L320i Fab

Lowest detectable helium leak rate (vacuum operation)	mbar x l x s <sup>-1</sup>	≤ 5 x 10 <sup>-12</sup>
Lowest detectable helium leak rate (sniffer operation)	mbar x l x s <sup>-1</sup>	< 1 x 10 <sup>-7</sup>
Connecting flange for units under test	DN	25 ISO-KF
Maximum detectable helium leak rate (vacuum operation)	mbar x l x s <sup>-1</sup>	> 0.1
Pumping speed during the evacuation process with SCROLLVAC SC 30 DL	m <sup>3</sup> x h <sup>-1</sup>	approx. 25
Pumping speed for helium in the vacuum mode	l/s	> 2.5
Time constant of the leak rate signal (blanked off, 63% of the final value)	s	< 1
Time until entering the ready mode	min	< 2
Dimensions (W x H x D)	mm	450 x 1200 x 1150
Available languages		English, German, Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish and Korean

#### Ordering Information

#### PHOENIX L320i Fab

	Part No.
PHOENIX L320i Fab	upon request
Custom PHOENIX L320i Fab	upon request

# Accessories

## RC 310 C / RC 310 WL Remote Control Units for Leak Detectors



Wired remote control unit RC 310 C



Wireless remote control unit RC 310 WL

The RC 310 remote control unit with their industrial design RC 310 WL (wireless) and RC 310 C (cable) and integrated data memory offer utmost flexibility during the leak detection process.

The RC 310 WL permits wireless remote monitoring up to a distance of 100 m. The RC 310 units support the current leak detectors of the PHOENIX L300i series as well as the UL 200 and L 200 models.

### Advantages to the User

- Easy operation via Touch Screen Panel 3.5"
- Wireless transmission up to 100 m, wired transmission up to 34 m
- Data transfer to Windows is possible
- Data backup on internal 32 MB data logger or USB stick is possible
- Possible operating with or without cable
- Adjustable alarm trigger
- Magnetic holder on the rear of the instrument
- Rugged industrial design with an IP 42 rating
- Scroll function for measured data (optional)
- USB connection for data transfer and software updates
- Adjustable loudspeaker and headphone output
- Search function (paging) via audible signal
- Peak hold (maximum value indication)
- For simultaneous detection of up to 10 leak detectors

### Typical Applications

- Mobile use with a portable leak detector due to wireless link
- Leak detection for analytics
  - Medicine technology
  - Solar systems
  - Research and development
  - Vacuum equipment
  - Accessories for the automotive industry
  - IT branch
  - Process industry



Different color displays on the remote control unit

## Technical Data

## RC 310

Display		TFT graphic touch panel 1/4 VGA / 3.5"; 240 x 320 px
Memory capacity		
Internal memory capacity	MB	64
of this available for recording data	MB	32
or memory stick		
Battery operating time (RC 310 WL only), (depending on charging condition)	hours	> 8
Wireless transmission range RC 310 WL	m	up to 100
HF output power (4 mW)	dBm	+6
Wireless transmission frequency RC 310 WL	GHz	2.4
Audio alarm at 1 m distance, max.	dB(A)	70
Headphone jack stereo 3.5 mm	Ohm	> 2 x 32
Permissible ambient temperature	°C	+5 to +40
Battery charger		
Mains voltages	V	100 -240 (+/- 10%)
Frequencies	Hz	50/60
Connectable leak detectors		PHOENIX L300I series, UL 200 line, L 200 series
Detection of leak detectors		up to 10
Available languages		English, German
Further languages		Chinese, Japanese (Katakana), Russian, French, Italian, Spanish, Polish and Korean
Protection class	IP	42
Charger protection class	IP	56
RC 310 WL radio permits		CE, FCC, IC, TELEC, MIC, MII
Dimensions (L x W x H)	mm	210 x 90 x 45
Weight		
RC 310 C, approx.	kg (lbs)	0.4 (0.88)
RC 310 WL, approx.	kg (lbs)	0.5 (1.1)

## Ordering Information

## RC 310

	Part No.
Remote control	
RC 310 C, wired with 4 m long connection cable	<b>252 013 V01</b>
RC 310 WL, wireless with battery charger (for integrated rechargeable battery) and wireless transmitter with connection cable (additional 4 m long connection cable)	<b>252 014 V01</b>
Accessories	
Wireless transmitter with connection cable (for operation of a further PHOENIXL)	<b>252 015 V01</b>
Extension cable, 10 m (three extensions max. are possible)	<b>140 22</b>



# Calibrated Leaks for Vacuum and Sniffer Applications



Test leaks

## Calibrated Leaks for Vacuum Applications

### TL 4 and TL 6

Calibrated leaks without gas reservoir (capillary type of leak) for sensitivity and signal response time determinations during vacuum leak detection and for determination of sniffer sensitivity for overpressure leak detection. Nominal leak rate ranges  $10^{-4}$  mbar x l x s<sup>-1</sup> for TL 4 and  $10^{-6}$  mbar x l x s<sup>-1</sup> for TL 6. Suitable for helium. A purging valve with hose nozzle permits a rapid exchange of the gas in the dead volume.

### TL 4-6

Helium calibrated leak (capillary leak) for gross leaks, adjustable in the range between  $10^{-4}$  to  $10^{-6}$  mbar x l x s<sup>-1</sup>, with exchangeable helium reservoir, pressure gauge and two manually operated valves. For calibration of leak rate readings and the alignment of helium mass spectrometers in the vacuum pressure range and for determining the sensitivity of sniffers in the overpressure range.

### TL 4

Calibrated helium leak (capillary leak) with reservoir which may be refilled and with a leak rate in the range of  $10^{-4}$  mbar x l x s<sup>-1</sup>. Special calibrated leak for use in a vacuum.

### TL 7 (For installation within the PHOENIX L300i)

Helium calibrated leak (capillary leak) with helium reservoir and electro-magnetically operated valve. Leak rate range  $10^{-7}$  mbar x l x s<sup>-1</sup>. The electro-magnetically operated valve provided permits the opening and closing of the calibrated leak to be controlled by the leak detector's software.

### TL 7

Calibrated helium leak (capillary leak) with helium reservoir, manual valve and He gas.

### TL 8 and TL 9

Helium calibrated leak calibrated for a leak rate in the range of  $10^{-8}$  mbar x l x s<sup>-1</sup> (helium leak rate) for TL 8 and  $10^{-9}$  mbar x l x s<sup>-1</sup> for TL 9, with gas reservoir and diaphragm shutoff valve. For alignment of a helium mass spectrometer, for calibration of the leak rate display of helium leak detectors and for response time measurements in connection with larger volumes.

### Note

All calibrated leaks with the exception of the TL 4 are not suited for use in a vacuum.

Calibrated leaks are required for the alignment of mass spectrometers, for the calibration of leak rates and for determining the response time of vacuum systems.

## Advantages to the User

- Factory certificate (included) in accordance with DIN 55 350-18-4.2.2
- Highly accurate
- Very low temperature dependence
- Determination of the nominal leak rate by comparison with a calibrated leak having a PTB <sup>1)</sup> certificate
- DAKKS <sup>2)</sup> certificate (optional), traceable to PTB
- Custom models for special applications

The nominal leak rate applies only if the calibrated leak has been connected to a vacuum system at a pressure of less than 1 mbar.

<sup>1)</sup> Federal Institution of Physics and Technology

<sup>2)</sup> Deutsche Akkreditierungsstelle GmbH (German Calibration Service)



### Calibrated Leaks for Sniffer Applications

These calibrated leaks have been set to a fixed value within the typical leak rate range (see Ordering Information). The exchangeable calibration gas reservoir is monitored through the built-in manometer.

### Helium calibrated leaks

S-TL 4 to S-TL 6 with leak rates from  $10^{-4}$  to  $10^{-6}$  mbar x l x s<sup>-1</sup>.

### Set of Calibrated Leaks for Power Plants

These three calibrated leaks of 1000, 100 and 10 mbar x l x s<sup>-1</sup> allow leak tests under partial flow conditions under the ambient conditions of power plants.

#### Technical Data

#### Leak Rate Range

#### Leak Detection Method

#### Connection Flange

TL 4, without helium gas reservoir	$10^{-4}$ mbar x l x s <sup>-1</sup>	Vacuum and sniffer	DN 16 ISO-KF
TL 6, without helium gas reservoir	$10^{-6}$ mbar x l x s <sup>-1</sup>	Vacuum and sniffer	DN 16 ISO-KF
TL 4-6, with helium gas reservoir	$10^{-4}$ to $10^{-6}$ mbar x l x s <sup>-1</sup>	Vacuum and sniffer	DN 16 ISO-KF
TL 4, with helium gas reservoir	$10^{-4}$ mbar x l x s <sup>-1</sup>	Vacuum	Discharging opening
TL 7, with helium gas reservoir	$10^{-7}$ mbar x l x s <sup>-1</sup>	Vacuum (for installation within the PHOENIX L300i)	Nozzle
TL 7, with manual valve and helium gas reservoir	$10^{-7}$ mbar x l x s <sup>-1</sup>	Vacuum	DN 10 ISO-KF
TL 8, with helium gas reservoir	$10^{-8}$ mbar x l x s <sup>-1</sup>	Vacuum	DN 10 ISO-KF
TL 9, with helium gas reservoir	$10^{-9}$ mbar x l x s <sup>-1</sup>	Vacuum	DN 10 ISO-KF
S-TL 4, with helium gas reservoir	$10^{-4}$ mbar x l x s <sup>-1</sup>	Sniffer	Nozzle
S-TL 5, with helium gas reservoir	$10^{-5}$ mbar x l x s <sup>-1</sup>	Sniffer	Nozzle
S-TL 6, with helium gas reservoir	$10^{-6}$ mbar x l x s <sup>-1</sup>	Sniffer	Nozzle

### Ordering Information

### Calibrated Leak

	Part No.
TL 4, without helium gas reservoir <sup>1)</sup>	<b>155 65</b>
TL 6, without helium gas reservoir <sup>1)</sup>	<b>155 66</b>
TL 4-6, with helium gas reservoir <sup>1)</sup>	<b>155 80</b>
TL4, with helium gas reservoir <sup>1)</sup>	<b>122 67</b>
TL 7, with helium gas reservoir <sup>1)</sup> for installation within the PHOENIX L300i filling pressure 8 bar filling pressure 2,9 bar	<b>140 23 V01</b> <b>140 23</b>
TL 7, with manual valve and helium gas reservoir <sup>1)</sup>	<b>142 10</b>
TL 8, with helium gas reservoir <sup>1)</sup>	<b>165 57</b>
TL 9, with helium gas reservoir <sup>1)</sup>	<b>144 08</b>
S-TL 4, with helium gas reservoir <sup>1)</sup>	<b>122 37</b>
S-TL 5, with helium gas reservoir <sup>1)</sup>	<b>122 38</b>
S-TL 6, with helium gas reservoir <sup>1)</sup>	<b>122 39</b>
Set of calibrated leaks for power plants 1000, 100, 10 mbar x l x s <sup>-1</sup>	<b>115 16</b>
Rubber bladder with hose clamp	<b>890 11</b>
Helium can; 1 l, 12 bar (for TL 4-6)	<b>252 001</b>
DAkKS calibration for TL 7/8/9	<b>154 15</b>
Factory calibration for He test leaks	<b>154 16</b>

<sup>1)</sup> With factory certificate

# Screw-in Calibrated Leaks

The manufacturers of helium leak testing systems are in need of calibrated leaks of various sizes with individually adjusted leak rates for the purpose of setting up and calibrating their systems.

Depending on the type of application these calibrated leaks are either installed in the test sample as a master leak or used as a continually available facility in the test chamber itself.

Oerlikon Leybold Vacuum is offering a complete family of calibrated leaks which are capable of meeting the requirements concerning type and required leak rate.



Calibrated leak with screw-in sleeve

## Calibrated Leak with Screw-in Sleeve

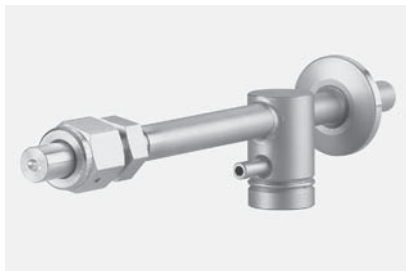
Is used as a so-called master leak to check the entire helium leak testing system.

Generally two leaktight test samples are equipped with these calibrated leaks. These will ensure proper separation between "passed and rejected" parts.

They are fitted to the customer's test samples either by a welded joint or the screw-in sleeve is glued in place.

### Typical Applications

- As a master calibrated leak built-in directly into the test sample
- Directly installed to the test chamber
- Use as a calibrated leak for sniffer applications



Calibrated leak with pin type casing

## Calibrated Leak with Pin Type Casing

Serves as a calibrated leak for the entire helium leak testing system without being influenced by the presence of a test sample.

Here a dummy is placed in the test chamber. The connection to the test chamber is directly by a DN 10 ISO-KF fitting. The test gas connection is either by a VCO fitting or a hose nozzle for flexible connections.

Connections on the side of the customer's system are

- 16 ISO-KF running to the vacuum chamber
- Hose nozzle, 10 mm in diameter or VCO fitting, 10 mm in diameter

### Advantages to the User

- Various types adapted to different customer requirements
- Simple to operate
- Easy to install



Calibrated leak with cylindrical casing

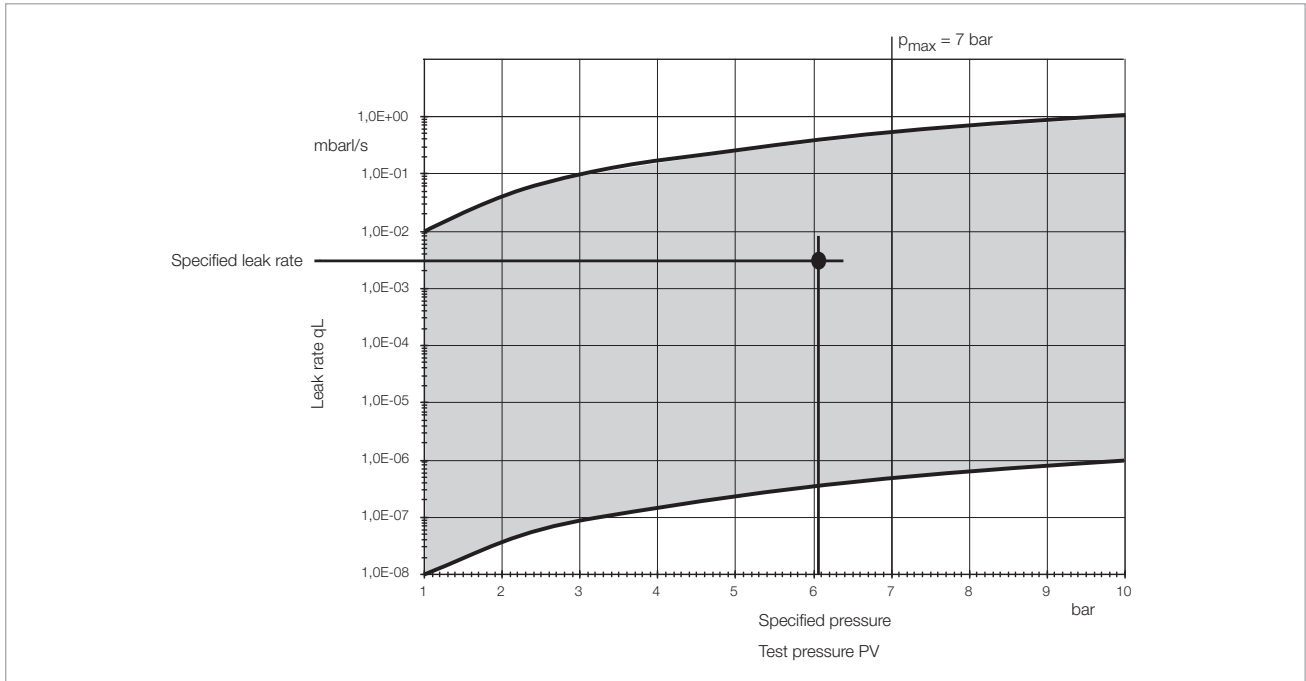
## Calibrated Leak with Cylindrical Casing

Is used to check the sensitivity of a sniffing facility.

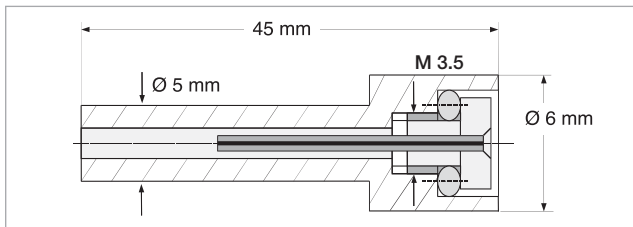
Before and after the actual test, the operator checks the sensitivity of his test facility within the scope of a plausibility check.

The connection on the side of the customer's system is provided via a VCO fitting for a diameter of 10 mm.

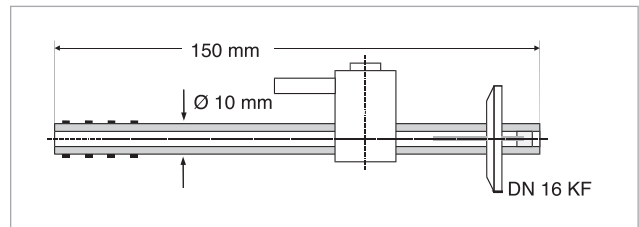
- Ideal installation dimensions
- As a rule, all calibrated leaks are supplied with a certificate (factory certificate) indicating the leak rate which has been set up



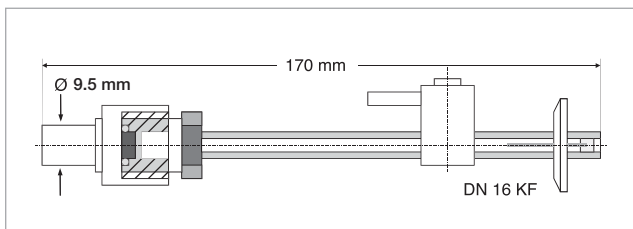
Leak rate as a function of applied forevacuum with reference to 0 bar (> 7 bar upon request)



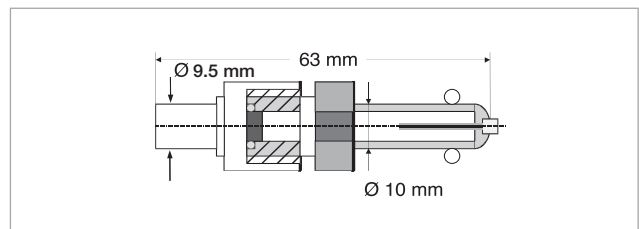
Calibrated leak with screw-in sleeve



Calibrated leak with pin type casing and hose nozzle



Calibrated leak with pin type casing and VCO fitting



Calibrated leak with cylindrical casing and VCO fitting

## Ordering Information <sup>1)</sup>

## Calibrated Leak

	Part No.
Calibrated leak	
with screw-in sleeve	<b>143 00</b>
with pin type casing and VCO fitting	<b>143 04</b>
with pin type casing and hose nozzle	<b>143 08</b>
with cylindrical casing and VCO fitting	<b>143 12</b>

<sup>1)</sup> When ordering please always state leak rate, test pressure and helium concentration

# Accessories for PHOENIX L300i, PHOENIX L300i DRY, PHOENIX L300i MODUL and PHOENIX L500i



Extension line

## 10 m Extension Line

The use of extension lines permits operation of the PHOENIXL 300 up to 34 m away from the test objects. A maximum of three extension lines (of 10 m each) may be connected in series.



Search gas spray gun

## Search Gas Spray Gun

The search gas spray gun with PVC hose (5 m long) is used for well aimed spraying of search gas at places where a leak is suspected.



Transport Case 300

## Transport Case 300

For impact protected transportation of the PHOENIXL 300; complete with strong carrying handles and plastic castors. Separate case for accessories.



Partial flow system without pump

## Partial Flow System only for PHOENIX L300i and PHOENIX L300i MODUL

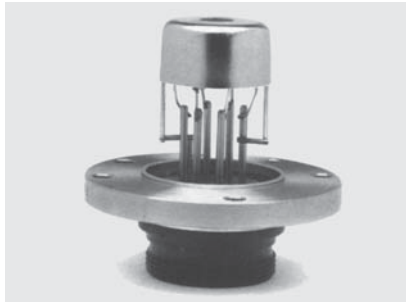
with following advantages:

- Faster response
- Entry into the measure mode already at an inlet pressure of 1000 mbar.
- Faster venting of large test objects or leak detection of mass production.

Equipment:

Valve block (with inlet valve, venting valve, bypass or purging valve) plus right-angle bellows valve DN 25 ISO-KF made of stainless steel, solenoid drives, suited for remote control by the PHOENIX L300i.

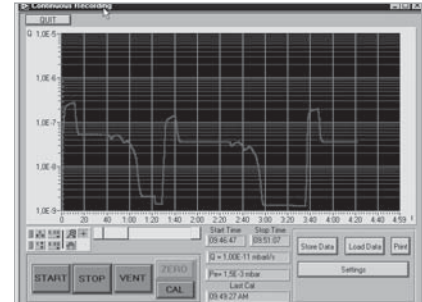
The partial flow systems are available without pumps.



Replacement ion source

## Replacement Ion Source

Complete replacement component, including two built-in yttrium coated iridium cathodes

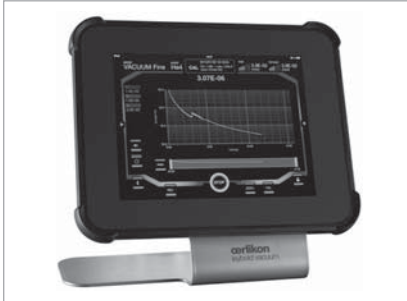


PC software LeakWare

## PC Software LeakWare

The Windows PC software is used for data acquisition, documentation of the measurements and to control the operation of the leak detector.

Hardware > 486 DX and 8 MB Ram  
Software Windows.



Tablet including Software, Protection Case and charging cable; tablet table stand



Tablet holder PHOENIX L300i



BARCODE Scanner tablet PHOENIX L300i

## Ordering Information

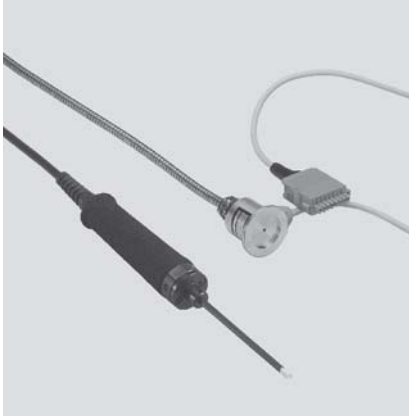
## Accessories

	Part No.
Transport Case 300 Dimensions, including castors and handles approx. 600 x 790 x 380 mm (W x H x D)	<b>252 004</b>
Partial flow system <sup>1)</sup> for PHOENIX L300i and PHOENIX L300i Modul 115 - 230 V / 50/60 Hz, without pump	<b>140 20</b>
AF 16-25 exhaust filter, for partial flow system	<b>189 11</b>
Replacement ion source	<b>165 04</b>
PC software LeakWare	<b>140 90</b>
10 m long extension line for RC 310	<b>140 22</b>
Search gas spray gun	<b>165 55</b>
Tablet incl. software (APP) and protection case (IP 67) PHOENIX L300i <sup>2)</sup>	<b>252005V01 or 252005V01-X</b>
Tablet holder PHOENIX L300i <sup>2)</sup>	<b>252007V01 or 252007V01-X</b>
BARCODE Scanner tablet PHOENIX L300i	<b>252008V01</b>
Tablet table stand PHOENIX L300i/500i <sup>2)</sup>	<b>252009V01 or 252009V01-X</b>
Tablet lock	<b>252010V01</b>

<sup>1)</sup> 5 centering rings, 5 clamping rings and 1 vacuum hose 1 m with DN 25 ISO-KF are included

<sup>2)</sup> Extension „X“ respectively with actual tablet version

# Helium Sample Probes (Sniffers)



Helium sniffer line SL 300



Helium sniffer QUICK-TEST QT 100 with sniffer



Helium sniffer line SL 301 in transport case

## Advantages to the User

### Helium Sniffer Line SL 300 and SL 301 for PHOENIX L300i

- Sniffer line connects directly at the test connection
- Status LEDs red and green (only at SL 300)
- ZERO pushbutton (only at SL 300)
- Easy filter removable
- Very fast response
- Extremely low detection limit  $< 1 \times 10^{-7} \text{ mbar} \times \text{l} \times \text{s}^{-1}$
- Rigid sniffer tip 120 mm
- Very rugged industrial design

### Helium Sniffers QUICK-TEST QT 100 for PHOENIX L300i

- Sniffer leak detection for greater distances between test object and leak detector
- Diaphragm pump for sucking the search gas
- Smallest detectable leak rate  $1 \times 10^{-6} \text{ mbar} \times \text{l} \times \text{s}^{-1}$
- Short response and decay times
- High sniffer velocity
- Switching power supply, can be run off mains voltages from 100 to 230 V AC

## Typical Applications

- Storage and transportation vessels for gases and liquids
- Gas supply systems
- Gas compressors
- Components for the cooling and air conditioning industries
- Heat pumps and components for thermal energy recovery units
- Chemical production plants
- Supply and phone lines laid in the ground
- Power station condensers and turbines
- Window and door seals of car bodies, refrigerators and alike
- Revision checks on leak testing systems
- Measurement of helium concentrations ranging from ppm to %
- All hollow objects exposed to overpressures

## Technical Data

## SL 300 / SL 301

## QT 100

Smallest detectable leak rate	mbar x l x s <sup>-1</sup>	< 10 <sup>-7</sup>	10 <sup>-6</sup>
Inlet pressure	mbar	< 0.13	–
Supply voltage		–	100-230 V, 50/60 Hz
Signal response time for			
SL 301 at a length of			
4 m	s	< 1	–
10 m	s	< 4	–
SL 300 at a length of			
5 m	s	< 1	1
10 m	s	< 5	–
20 m	s	–	< 6
50 m	s	–	20
Connection flange	DN	25 ISO-KF	25 ISO-KF
Weight	kg (lbs)	0.6 (1.3)	3.5 (7.7)

## Ordering Information

## SL 300 / SL 301

## QT 100

	Part No.	Part No.
Helium sniffer line with rigid sniffer tip 120 mm		
SL 300		
red/green LED		
ZERO button		
4 m long, straight handle	<b>252 003</b>	–
SL 301		
4 m long, straight handle	<b>252 025 V01</b>	–
10 m long, straight handle	<b>252 026 V01</b>	–
Helium sniffer QUICK-TEST QT 100	–	<b>155 94</b>
Sniffer line for the QT 100		
5 m	–	<b>140 08</b>
20 m	–	<b>140 09</b>
50 m	–	<b>121 83</b>
Spare Parts for SL 301		
Filter insert, 2 pieces	<b>ESLMSA-92097</b>	–
Stainless steel tube with capillary tube	<b>E-LST-30</b>	–

# Miscellaneous

## Connection Flanges

### Leak Detectors

### Helium Sniffers

### Calibrated Leaks

PHOENIX L300i	– DN 25 ISO-KF	SL 300	– DN 25 ISO-KF	TL 4	– DN 16 ISO-KF
PHOENIX L300i DRY	– DN 25 ISO-KF	QT	– DN 25 ISO-KF	TL 6	– DN 16 ISO-KF
PHOENIX L300i MODUL	– DN 25 ISO-KF	ST 100	– DN 25 ISO-KF	TL 4-6	– DN 16 ISO-KF

If components of the same nominal width are connected, only one centering ring and one clamping ring will be required.

## Connection Components

When wanting to connect accessories (helium sniffer and calibrated leaks) to a leak detector, the following reducers and components may be necessary:

### Reduction

### Reducers

### Centering Rings Stainless steel/FPM

### Clamping Rings Aluminum

	Part No.	Part No.	Part No.
DN 25 ISO-KF / 16 ISO-KF	<b>183 86 (Aluminum) or 885 04 (Stainless steel)</b>	<b>DN 25 ISO-KF, 883 47 DN 16 ISO-KF, 883 46</b>	<b>DN 20 / 25 ISO-KF, 183 42 DN 10 / 16 ISO-KF, 183 41</b>
DN 40 ISO-KF / 25 ISO-KF	<b>183 87 (Aluminum) or 885 05 (Stainless steel)</b>	<b>DN 40 ISO-KF, 883 48 DN 25 ISO-KF, 883 47</b>	<b>DN 32 / 40 ISO-KF, 183 43 DN 20 / 25 ISO-KF, 183 42</b>
DN 40 ISO-KF / 16 ISO-KF	<b>183 89 (Aluminum) or 885 07 (Stainless steel)</b>	<b>DN 40 ISO-KF, 883 48 DN 16 ISO-KF, 883 46</b>	<b>DN 32 / 40 ISO-KF, 183 43 DN 10 / 16 ISO-KF, 183 41</b>
DN 63 ISO-K / 40 ISO-KF	<b>269 40 (Aluminum) or 887 40 (Stainless steel)</b>	<b>DN 63 ISO-K, 887 03 DN 40 ISO-KF, 883 48</b>	<b>DN 63 / 250 ISO-K, <sup>1)</sup> DN 32 / 40 ISO-KF, 183 43</b>

<sup>1)</sup> See clamps for ISO-K flanges in the Product Part "Flanges and Fittings"

The following metal hoses are recommended to connect the leak detectors to systems:

### Nominal Width

### Length

### Ordering Information

		Part No.
DN 16 ISO-KF	1.0 m	<b>868 01</b>
DN 16 ISO-KF	0.5 m	<b>867 91</b>
DN 25 ISO-KF	1.0 m	<b>868 03</b>
DN 25 ISO-KF	0.5 m	<b>867 93</b>
DN 40 ISO-KF	1.0 m	<b>868 05</b>
DN 40 ISO-KF	0.5 m	<b>867 95</b>

Further connecting components, like quick clamping rings and other components are described in Product Part "Flanges and Fittings"